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Braking Device for Vehicles

[Bremsvorrichtung fuer Fahrzeuge]

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Braking Device for Vehicles /1[1]

The invention involves a braking device for vehicles according to the main concept of Claim 1.

Such braking devices for vehicles are known, for example, from the publication, "Vehicle Technical Pocket Manual", of the Robert Bosch Co., VDI Publishers, 22nd Edition, 1995, page 612 ff.

Existing legal regulations require a transmission device with at least two circuits.

A II-distribution, a so-called front axle/rear axle distribution, has evolved, in which one braking circuit acts on the front axle and one brake circuit on the rear axle, as well as an X-distribution, a diagonal distribution, in which each brake circuit acts on one front wheel and the diagonally opposite rear wheel.

In addition there are also the so-called HI-distribution, a front and rear axle/front axle distribution, in which one brake circuit acts on the front axle and the rear axle and one brake circuit only on the rear axle, and the LL-distribution, a front axle and rear wheel/front axle and rear wheel distribution, in which each brake circuit acts on the front axle and a rear wheel, and the

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[1] Numbers in the margin indicate pagination in the foreign text.

HH-distribution, a front and rear axle/front and rear axle distribution, in which each brake circuit acts on the front /2 axle and the rear axle.

The X-distribution is used in particular in front axle loaded vehicles. The future development of vehicle brake devices will move in the direction of electromechanical wheel brake devices. Such electromechanical wheel brake devices have the advantage, that they do not need hydraulic fluid and thus are "dry" wheel brake devices, which are also very advantageous with regard to environmental considerations. In addition, they manifest very advantageous electrical control by means of brake-by-wire systems.

In vehicles with an X-distribution, i.e., with a diagonal circuit distribution, there is the problem, that electromechanical wheel brake devices on the rear axle cannot be combined with hydraulic wheel brake devices on the front axle without additional considerations, since by means of such a combination the dual circuits of the brake system which requires the same medium for each of the two circuits, thus for example a hydraulic or an electromechanical one, cannot be guaranteed. In the arrangement involving electromechanical brakes on the rear axle, each of the diagonally positioned brake circuits would have to include a combination of a hydraulic front wheel brake and an electromechanical rear wheel brake. Thus, for example, with a complete failure of the electromechanical wheel brakes the proper functioning of both brake circuits could not be completely guaranteed, since the two electromechanical rear wheel brakes are a part of each of the two brake circuits.

The invention has the goal of further developing a brake device of this type in such a way, that even with front axle loaded vehicles electromechanical wheel brake devices can be used on /3 the rear wheels.

This goal is achieved by a braking device for vehicles of the type of the invention described at the outset having the characteristics of Claim 1. By constructing the transmission device as a three- circuit brake system, in which one brake circuit is associated with a front wheel and in which a third brake circuit is associated with the rear wheels, on which wheel brake devices are activated by electrical actuators, the legally required minimal delay is attained with vehicles that are also loaded at the axles.

The circuits associated with the front wheel brake devices preferably include a braking force amplifier and a main brake cylinder, by means of which the hydraulic wheel braking device, which is associated with each front wheel, is activated. It is thereby especially advantageous, that the braking force amplifier can be designed basically smaller, than was the case with the customary brake devices for vehicles.

The extent of the activation of the rear wheel braking devices preferably occurs directly by means of a driver's desired exertion on the brake pedal or by means of a braking pressure which is present in the circuits associated with the front wheel braking devices. The braking device described has the advantages, that it can be produced economically, can be constructed very compactly, and, for example, does not require a redundant onboard network for brake-by-wire, no redundant signal processing, and no redundant electronics.

The third brake circuit can preferably also be manually activated. As a result a parking brake function can be achieved.

Other advantages and properties of the invention are the /4
objects of the following description, as well as a drawn depiction of an execution model of the invention which is schematically shown in the figure.

A braking device for vehicles, which is shown in the figure, includes a low-pressure braking force amplifier 10 by means of which a main braking cylinder 12 is activated. Two separate brake circuits 21, 22 go from the main brake cylinder 12 to the front wheels 31, 32. Hydraulic wheel brake devices 41, 42 are positioned on the front wheels 31, 32, which can be controlled across the two separate brake circuits 21, 22 by means of an electronic control device 50. The low-pressure braking force amplifier 10 is activated by a brake pedal 13 in the known manner.

The braking device includes an additional transmission device in the form of a third electrical brake circuit 23, by means of which there is control of the electrically activated actuators 43, 44 that are placed on the rear wheels 33, 34, which activate electromechanical braking device by means of a motor 43a, 44a. These electromechanical braking devices 43, 43a, 44, 44a are controlled either directly by the driver's exertion on the pedal 13 or by a brake pressure on the front axle, as schematically depicted in the figure.

If a front axle circuit fails, three wheel brake units still remain active, in order to obtain a residual braking effect.

In addition an electromechanical parking brake is provided, as schematically shown in figure, that acts on the electromechanical rear wheel braking units 43, 43a, as well as 44, 44a.

Patent Claims /5

1. Braking device for vehicles including an activation device operated by the vehicle driver (10, 12, 13) by means of which wheel brake devices (41, 42, 43, 43a, 44, 44a) are activated by a transmission device, whereby the transmission includes at least two brake circuits associated with different wheel brake devices separate from each other, thereby characterized, by the transmission device including three brake circuits (21, 22, 23) whose first and second ones are associated with a front wheel braking device (41, 42) and whose third one is associated with rear wheel braking devices activated by electrical actuators.
2. Braking device according to Claim 1 thereby characterized by the braking circuit (21,22) associated with the front wheel braking devices including a braking force amplifier (10) and a main braking cylinder (12) by means of which two hydraulic wheel braking devices (41, 42) which are each associated with a front wheel (31, 32) are activated.
3. Braking device according to Claims 1 or 2 thereby

characterized by the strength of the activation of the rear wheel braking devices (43, 44) depending on the brake pressure present in the braking circuits (21, 22) associated with the front wheels (31, 32) or occurring as the driver desires.

4. Braking device according to one of Claims 1 to 3 /6 thereby characterized by the third braking circuit also being manually activated to function as a parking brake.

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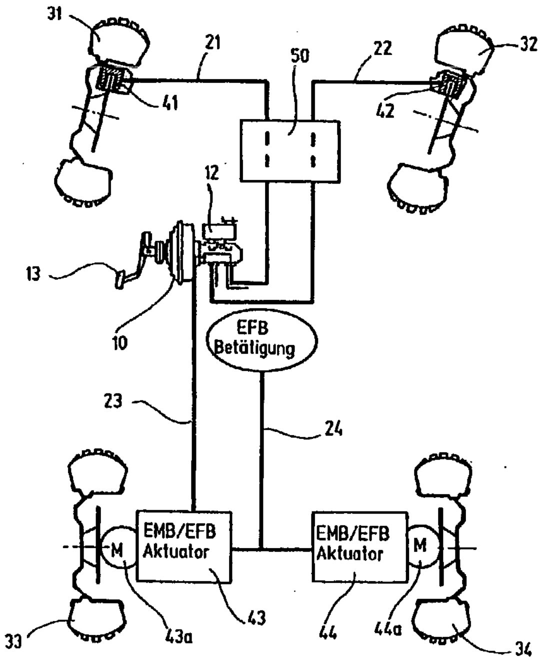
[Figure]



EFB [unknown]

Activation

EMB/EFB [unknown]

Actuator

EMB/EFB

Actuator